



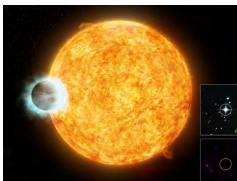
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Six Figures for Science: Space Station Express Rack Reaches 100,000 Hours of Operation

The International Space Station's EXPRESS Rack 1 exceeded 100,000 hours of operation as of Oct. 4. EXPRESS Rack is a multipurpose rack system that houses and supports research aboard the space station.

Since 2001, the rack has housed numerous experiments leading to ground-breaking science discoveries, Earth benefits and technology innovations that will aid in future space travel.

EXPRESS stands for EXpedite the PProcessing of Experiments to the Space Station and can support science experiments in any discipline by providing structural interfaces, power, data, cooling, water and other items needed to operate science experiments in space.

"It's rewarding to see one of our EXPRESS Racks reach this milestone and continue to serve as an integral

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Marshall Team Encouraged to Get on the Bus!

Combined Federal Campaign bus tours start rolling Oct. 15.

Bus tours give NASA's Marshall Space Flight Center team members a first-hand look at the important work local charities are doing across North Alabama.

"This is an opportunity to explore some of the charities within CFC and have an immediate view of how they support our community," said 2014 CFC bus tour coordinator Cindy Spidel of Marshall's Engineering Directorate.



Team members may still sign up for a tour of Ability Plus Oct. 16 from 9-11 a.m. to learn about housing, medical,

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Express Rack *Continued from page 1*

part of space station science research,” said Annette Sledd, International Space Station Office manager at NASA’s Marshall Space Flight Center. “The versatility of the EXPRESS Racks to provide standard interfaces and utilities has been key to their success and expanded use in support of ISS research, technology demonstrations and housing of payload support equipment.”

Key science payloads flown in EXPRESS Rack 1 range from Protein Crystal Growth, Advanced Astroculture™, Acceleration Monitoring systems, lab refrigerators/incubators, to the Rodent Research hardware currently installed.

The Advanced Astroculture plant growth chamber research demonstrated that plants can complete their seed-to-seed life cycle in microgravity over two generations, and also determined the effects of microgravity on genetic and chemical differences in soybean seeds produced on the ISS as compared to seeds harvested on Earth. Soybeans are a widely used food crop on Earth and a potential food crop for future long duration space missions, so understanding their growth is critical for production for those on Earth and in space. The unique air scrubber that was designed to keep the plants healthy within the Advanced Astroculture hardware has also contributed to national security, cancer-fighting pharmaceuticals and educational tools for students.

Protein crystals grown in microgravity can help scientists gain detailed knowledge of the atomic, three-dimensional structure of many important protein molecules used in pharmaceutical research for cancer treatments, stroke prevention and other diseases. On Earth, the protein crystallization process is hindered



NASA astronaut James Voss works on the EXPRESS Rack 1 on May 14, 2001, during space station Expedition 2. Then the rack housed experiments such as the Advanced Astroculture™, Commercial Generic Bioprocessing Apparatus, Commercial Protein Crystal Growth-High Density, Protein Crystal Growth-Single Locker Thermal Enclosure System, Microgravity Acceleration Measurement System and Space Acceleration Measurement System. (NASA/JSC)

by forces of sedimentation and convection since the molecules in the crystal solution are not of uniform size and weight. The knowledge gained from growth without these restrictions could be instrumental in the design and testing of new drugs.

The Marshall Center developed and manages the EXPRESS racks for the ISS space station. The racks, built by the Boeing Co., are successfully operating beyond their original 10-year design life, and Huntsville and Boeing engineers continue to provide replacement parts and assist investigators in building experiments to work in the station racks.

CFC *Continued from page 1*

job training and family support services for kids and adults with intellectual and developmental disabilities.

Slots are also open to visit the Boys & Girls Club of North Alabama Oct. 16 from 1-3 p.m. for a behind-the-scenes look at how the organization helps inspire young people to reach their full potential as productive, responsible and caring citizens.

Other upcoming bus tours include the Burritt Museum, Downtown Rescue Mission, Huntsville Museum of Art and the Huntsville-Madison County Rescue Squad.

Marshall CFC organizers would like to see increased participation from Marshall team members in 2014.

“I challenge every organization to make this a part of their weekly staff meeting,” said Spidel. “Maybe even consider holding your staff meeting on the road. It would be easy to go over the items you normally would on their ride over or back from the charities.”

For more information or to sign up for a tour, visit the [complete schedule](#) online.

NASA Lunar Mission Wins 2014 Popular Mechanics Breakthrough Award

NASA's Lunar Atmosphere and Dust Environment Explorer mission has received the Popular Mechanics 2014 Breakthrough Award for innovation in science and technology. Breakthrough Awards recognize innovators, engineers and scientists responsible for changing our world.

The award acknowledges LADEE's modular flexible construction and laser data transfer capability, which can send and receive data more than six times faster than the quickest space-based radio signals.

NASA's Marshall Space Flight Center managed LADEE within the Lunar Quest Program Office. "We are extremely proud of the LADEE team and are honored to have been involved in the incredible success of this mission," said Danny Harris, Marshall's Lunar Quest Program mission manager for LADEE.

LADEE launched in September 2013 from the Mid-Atlantic Regional Spaceport at NASA's Wallops Flight Facility. The car-sized lunar orbiter gathered detailed information on the structure and composition of our moon's thin atmosphere and data to determine whether dust is being lofted into the lunar sky. A thorough understanding of these characteristics of our nearest celestial neighbor will help researchers understand other bodies in the solar system, such as large asteroids, Mercury and the moons of outer planets.

The occasion of its launch was the first flight of a U.S. Air Force Minotaur V rocket which uses excess ballistic missile components converted into a space launch vehicle and operated by Orbital Sciences Corp. of Dulles, Virginia. It also was the first launch beyond Earth orbit from the agency's Virginia launch facility.

Hosted aboard LADEE for its ride to lunar orbit was the Lunar Laser Communication Demonstration terminal. From a distance of almost a quarter-of-a-million miles, LLCD demonstrated record-breaking upload and download speeds. The cooperative mission with a team from NASA's Goddard Space Flight Center and the Massachusetts Institute of Technology's Lincoln Laboratory revealed the possibility of expanding broadband capabilities in future space communications development.

LADEE was built using a Modular Common Spacecraft Bus architecture -- a general purpose spacecraft design



LADEE spacecraft being prepared for final checkout before being installed on the launch vehicle at Wallops. (NASA/LADEE Integration and Test Team)

that allows NASA to develop, assemble and test multiple spacecraft modules at the same time. The LADEE bus structure was a lightweight carbon composite weighing 547.2 pounds unfueled and 844.4 pounds when fully fueled.

The successful mission was concluded April 18 when ground controllers at NASA's Ames Research Center confirmed the spacecraft impacted the surface of the moon, as planned. LADEE was designed for a relatively short mission, as the science goals only required 100 days of data collection.

NASA's Science Mission Directorate funded the LADEE mission. NASA's Ames Research Center managed the overall mission.

For more information about the LADEE mission, visit [here](#).

A 'Hot Jupiter'

A new study using data from NASA's Chandra X-ray Observatory has shown that a planet is making the star that it orbits act much older than it actually is. The artist's illustration featured in the main part of this graphic depicts the star, WASP-18, and its planet, WASP-18b.

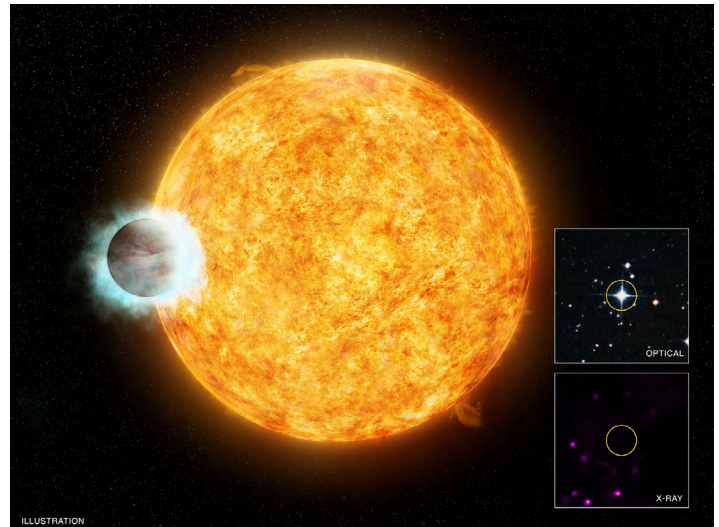
WASP-18b is a "hot Jupiter," a giant exoplanet that orbits very close to its star, located about 330 light years from Earth. Specifically, the mass of WASP-18b is estimated to be about 10 times that of Jupiter, yet it orbits its star about once every 23 hours. By comparison, it takes Jupiter about 12 years to complete one trip around the sun from its great distance.

The new Chandra data of the WASP-18 system show that this huge planet is so close to its star that it may be causing a dampening of the star's magnetic field. As stars age, their X-ray and magnetic activity decreases. Astronomers determined that WASP-18 is only between 500 million and 2 billion years old, a relatively young age for a star. Given this age, astronomers expect that WASP-18 would be giving off copious amounts of X-rays.

Surprisingly, the long Chandra observations reveal no X-rays being emitted from WASP-18, as seen in the lower inset box. The same field-of-view in the upper inset box shows that in optical light WASP-18 is a bright source. Using established relations between the magnetic activity and X-ray emission of stars and their age, the researchers concluded that WASP-18 is about 100 times less active than it should be at its age.

The low amount of magnetic activity from WASP-18 is shown in the artist's illustration by the lack of sunspots and strong flares on the surface of the star. The weak X-ray emission from the star has relatively little effect on the outer atmosphere of the nearby planet, giving it a symmetrical appearance. By contrast, much stronger X-rays from the star CoRoT-2a are eroding the atmosphere of its nearby planet, producing a tail-like appearance.

Tidal forces from the gravitational pull of the massive planet -- similar to those the moon has on Earth's tides but on a much larger scale -- may be responsible for disrupting the magnetic field of the star. The strength of the magnetic field in a star



(X-ray: NASA/CXC/SAO/I.Pillitteri et al; Optical: DSS)

depends on the amount of convection, the process by which hot gas moves around the stellar interior. The planet's gravity may cause motions of gas inside the star that weaken the convection. Because WASP-18 has a narrower convection zone than most stars, it is more vulnerable to the impact of tidal forces that tug at it.

The effect of tidal forces from the planet may also explain an unusually high amount of lithium found in earlier, optical studies of WASP-18. Lithium is usually abundant in younger stars, but over time convection carries lithium to the hot inner regions of a star, where it is destroyed by nuclear reactions. If there is less convection, the lithium does not circulate into the interior of the star as much, allowing more of it to survive.

NASA's Marshall Space Flight Center manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations.

Second Lunar Eclipse of 2014 Delights Sky Watchers

On the morning of Oct. 8, not long before sunrise, the bright full moon over North America turned a lovely shade of celestial red. The lunar eclipse was visible from all parts of the United States.

This eclipse marks the second in a series of four lunar eclipses in a row, [known as a “tetrad.”](#) The first in the series occurred April 15, with the third in the tetrad of eclipses set for April 2015 and the final in September 2015.

A lunar eclipse happens when Earth casts a shadow that blocks sunlight normally reflected off the moon. A total lunar eclipse can only happen when the sun, Earth and moon are perfectly aligned. During the time of total eclipse, the moon will often look reddish due to red and orange light being scattered by the atmosphere. This eerie, harmless effect has earned the tongue-in-cheek nickname “blood moon.”



Lunar eclipse on the morning of Oct. 8. (NASA)